Determination of Freshwater Inflow Volume from the Trinity River into Trinity Bay

Amy Beussink, Supervisory Hydrologist
Gulf Coast Program Office Chief
U.S. Geological Survey, Texas Water Science Center

U.S. Department of the Interior
U.S. Geological Survey

Background

- Tides and runoff influence discharge in lower reaches of coastal basins.

Trinity River near Wallisville, TX

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Background

- Accurate discharge measurements are important for understanding sediment and nutrient inputs into the Galveston Bay Ecosystem.

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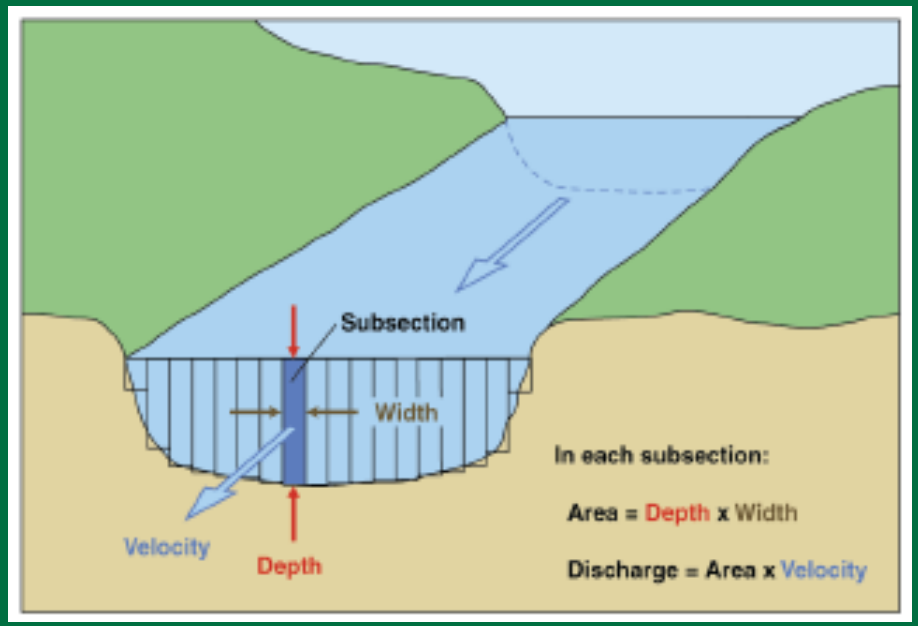
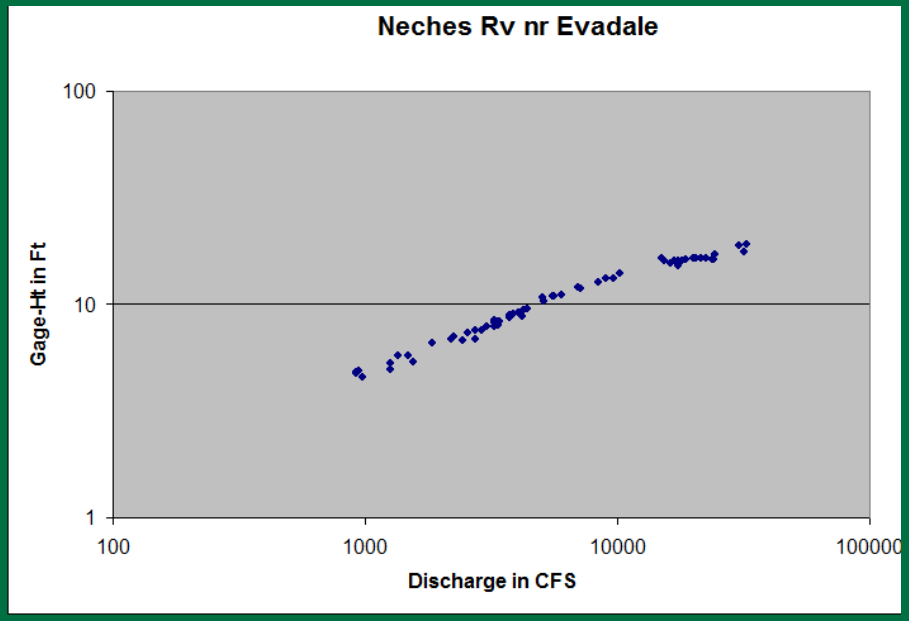
Traditional Stage-Discharge Relationships



Very predictable



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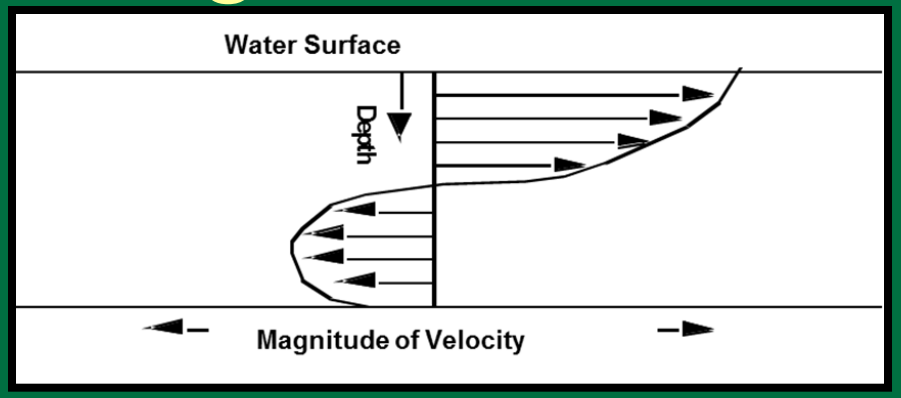
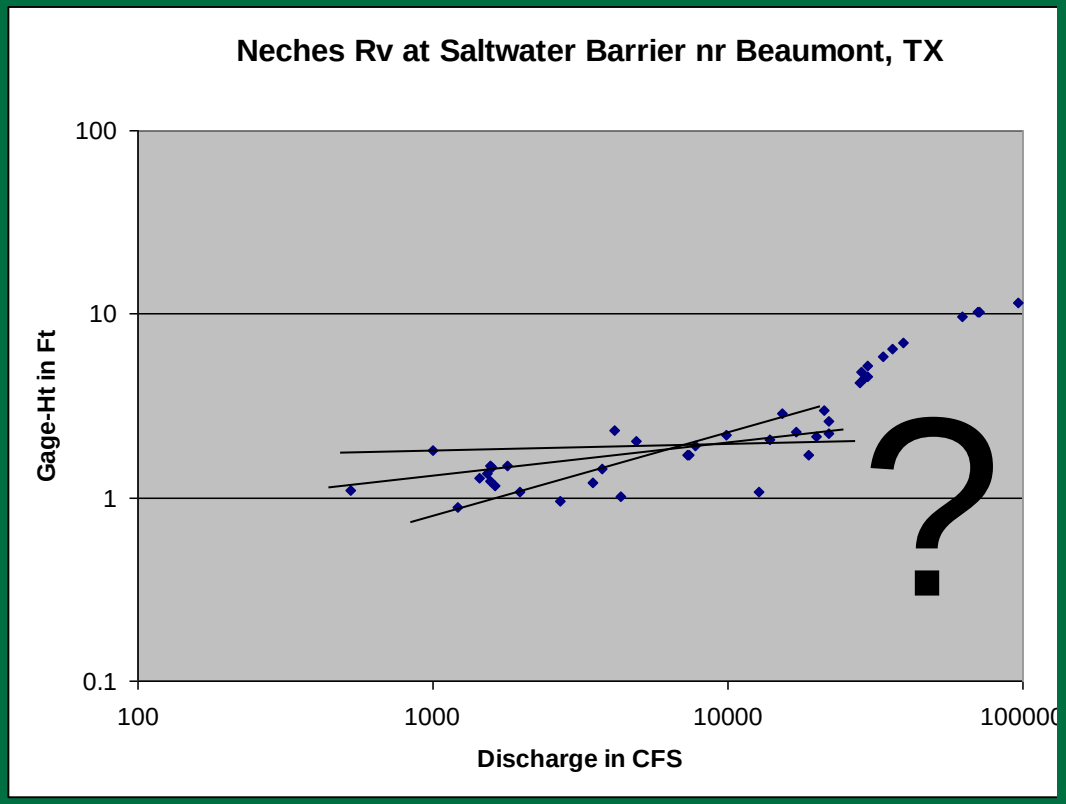
Non-traditional Settings

Variable backwater – multiple discharge for same stage





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Background

- Upstream gages may not be accurate for measuring inflows into Galveston Bay.
- Non-traditional methods can be used (e.g. Index-velocity).

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Objectives

1. Define tidal flow patterns in the lower reaches of the Trinity River.
2. Evaluate the variability of nutrient and sediment concentrations and loads entering the Galveston Bay ecosystem over a range of hydrologic conditions.
3. Define correlations between in situ field measurements and discrete nutrient and sediment concentrations.

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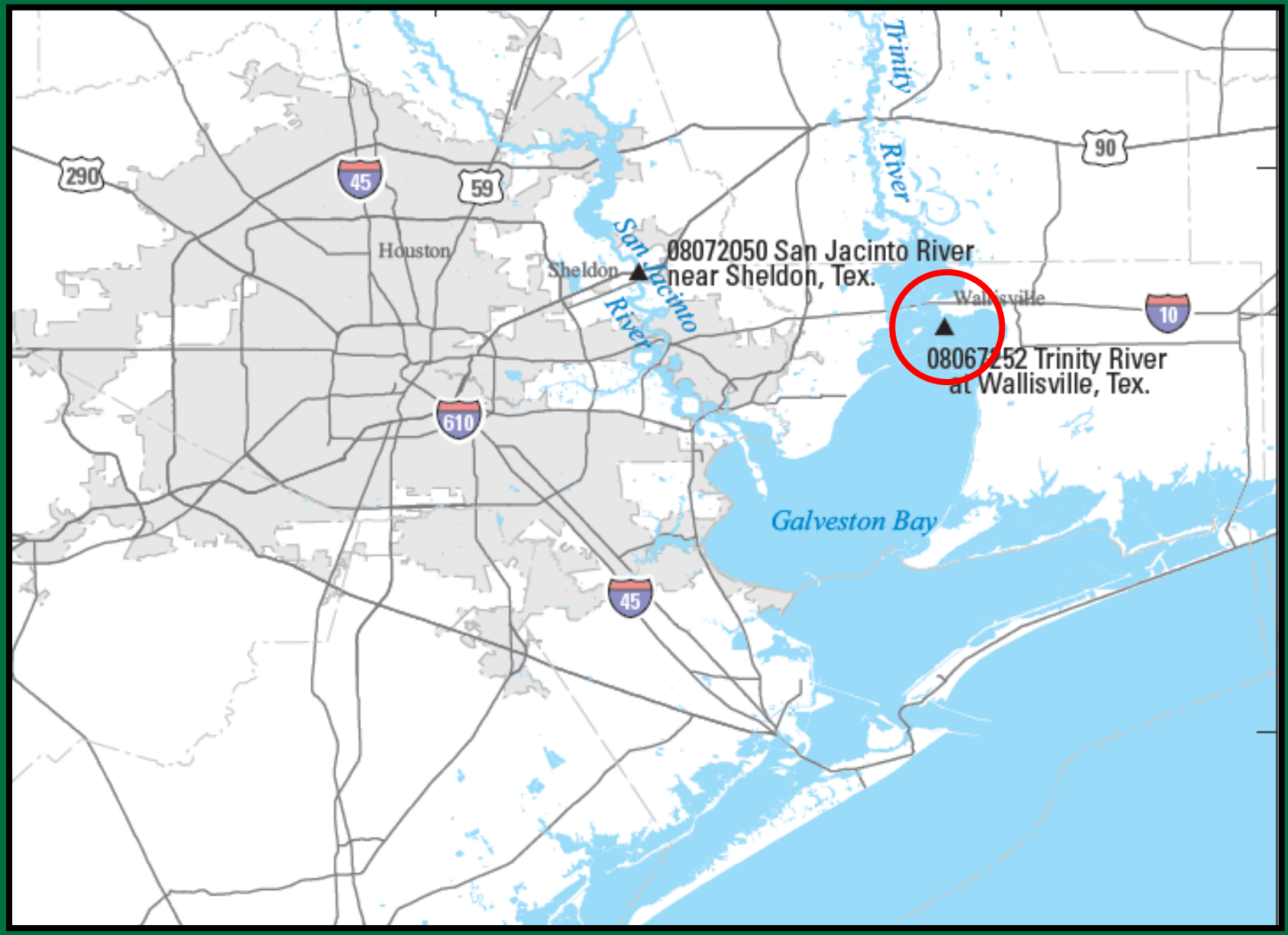
290
45
59
Houston
Sheldon
08072050 San Jacinto River
near Sheldon, Tex.
San Jacinto
River
Trinity
River
90
Wallisville
10
08067252 Trinity River
at Wallisville, Tex.
610
Galveston Bay
45

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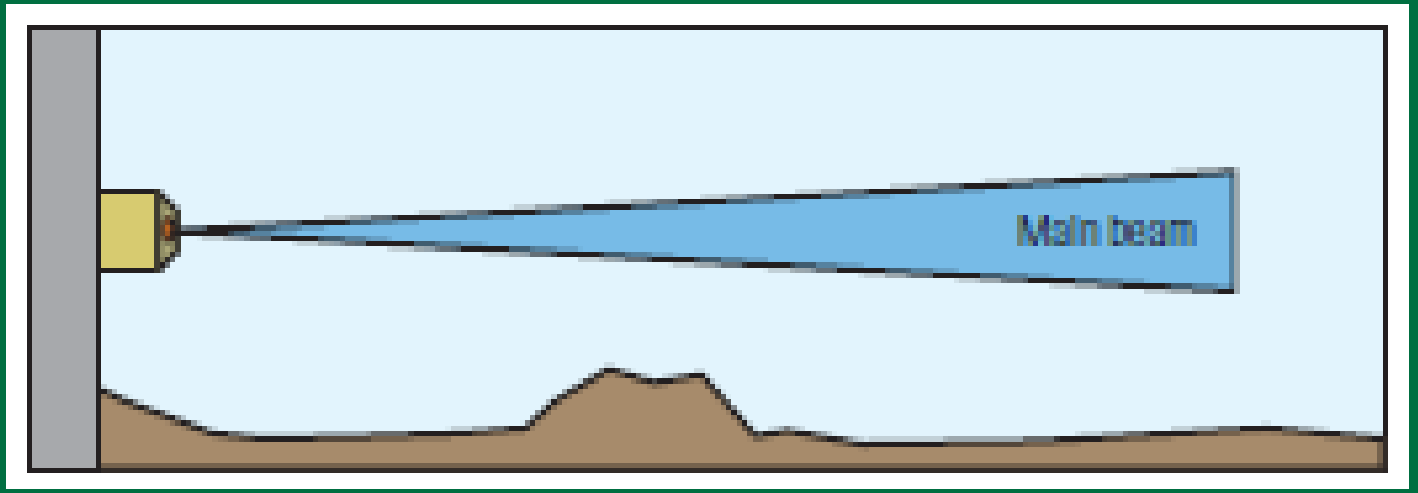
Methodology

Task 1. Installation and Operation of an Index Velocity Meter

- Determine magnitude and direction of flow
- Parameters measured
  - water velocity
  - acoustic signal strength
  - water stage



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Gage was installed on April 2014

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http://waterdata.usgs.gov/tx/nwis/current/?type=flow

Station: 08067252 Trinity River nr Wallisville, TX

waterdata.usgs.gov/tx/nwis/current/?type=flow

USGS Water Resources (District Access)

Data Category: Current Conditions | Geographic Area: Texas | GO

Click to hide News Bulletins

- Try our new Mobile-friendly water data site from your mobile device!
- Full News

Click to hide state-specific text

Current Conditions for Texas: Streamflow -- 527 site(s) found

PROVISIONAL DATA SUBJECT TO REVISION

--- Predefined displays --- | Group table by | Select sites by number or name

Texas Streamflow Table | Major River Basin | 08067252 | site number | go | show sites on a map

Customize table to display other current-condition parameters

Station Number	Station name	Date/Time	Gage height, feet	Dis-charge, ft3/s	Long-term median flow 10/21
Undefined					
07336820	Red River near De Kalb, TX	10/21 10:00 CDT	9.29	1,910	4,280
Arkansas River Basin					
07227420	Cramer Ck at US Hwy 54 nr Dalhart, TX	10/21 10:30 CDT	3.18	0.00	.000
07227460	E Fk Cheyenne Ck Trib nr Channing, TX	10/21 10:30 CDT	2.54	--	---
07227500	Canadian Rv nr Amarillo, TX	10/21 10:15 CDT	1.09	12	20.0
07227890	Big Blue Ck nr Fritch, TX	10/21 10:15 CDT	6.71	0.47	.000
07228000	Canadian Rv nr Canadian, TX	10/21 10:45 CDT	1.80	48	19.0

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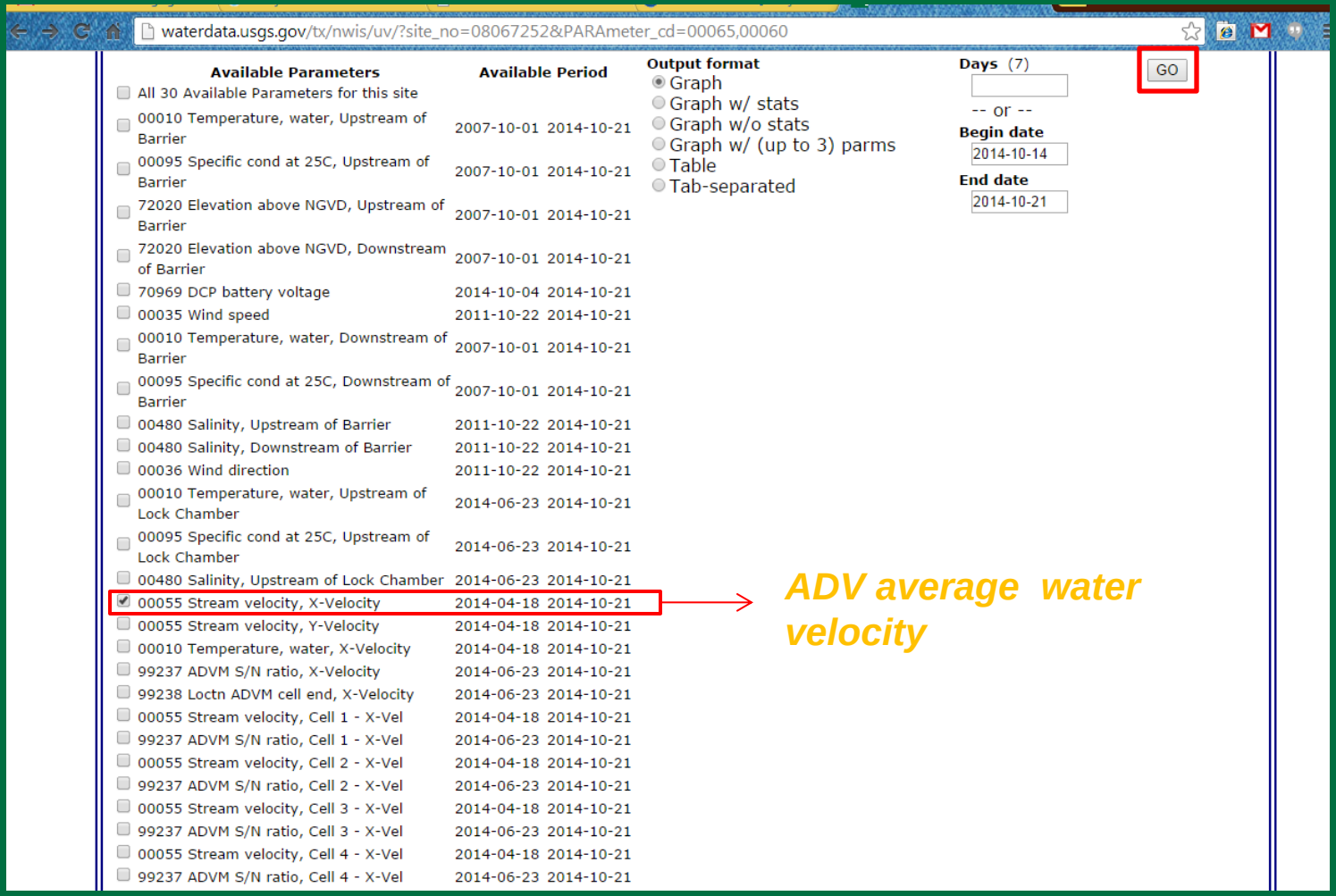
http://waterdata.usgs.gov/tx/nwis/current/?type=flow

Station: 08067252 Trinity River nr Wallisville, TX



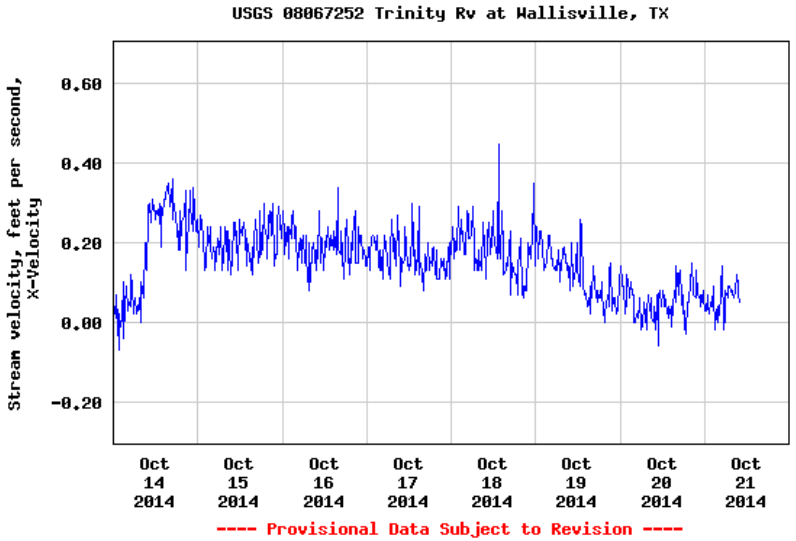
waterdata.usgs.gov/tx/nwis/uv?cb_00055=on&cb_00065=on&format=gif_default&site_no=08067252&period=&begin_date=2014-1

☑ 00055 Stream velocity, Cell 3 - X-Vel	2014-04-18	2014-10-21
☐ 99237 ADVM S/N ratio, Cell 3 - X-Vel	2014-06-23	2014-10-21
☑ 00055 Stream velocity, Cell 4 - X-Vel	2014-04-18	2014-10-21
☐ 99237 ADVM S/N ratio, Cell 4 - X-Vel	2014-06-23	2014-10-21
☑ 00055 Stream velocity, Cell 5 - X-Vel	2014-04-18	2014-10-21
☐ 99237 ADVM S/N ratio, Cell 5 - X-Vel	2014-06-23	2014-10-21
☑ 00065 Gage height, NAVD 88	2014-04-22	2014-10-21

Summary of all available data for this site
Instantaneous-data availability statement

Stream velocity, feet per second, X-Velocity

Most recent instantaneous value: 0.05 10-21-2014 10:00 CDT



Add up to 2 more sites and replot for "Stream velocity, feet per second, X-Velocity"

Add site numbers Note

Enter up to 2 site numbers separated by a comma. A site number consists of 8 to 15 digits

GO

Create presentation-quality / stand-alone graph. Subscribe to WaterAlert P00055 DD24 A(0)

Share this graph |

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Task 2. Hydrologic monitoring

- Collection of water quality samples for nutrients and sediment over a range of hydrologic conditions
- Physical and water quality properties measured

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11 samples have been collected since the installation of the index-velocity gage

Parameter	N	Mean	Min	Max	Std. Dev.
Turbidity, Form Neph FNU	11	17.8	2.7	110.0	30.8
Ammonia, wf mg/l as N	8	0.03	0.01	0.11	0.03
NO3+NO2, wf mg/l as N	8	0.174	0.040	0.645	0.251
Nitrite, wf mg/l as N	8	0.006	0.001	0.021	0.007
Orthophosphate, wf mg/l	8	0.033	0.004	0.053	0.016
Phosphorus, wu mg/l	8	0.111	0.059	0.274	0.068
Total nitrogen, wu mg/l	8	0.84	0.60	1.64	0.37

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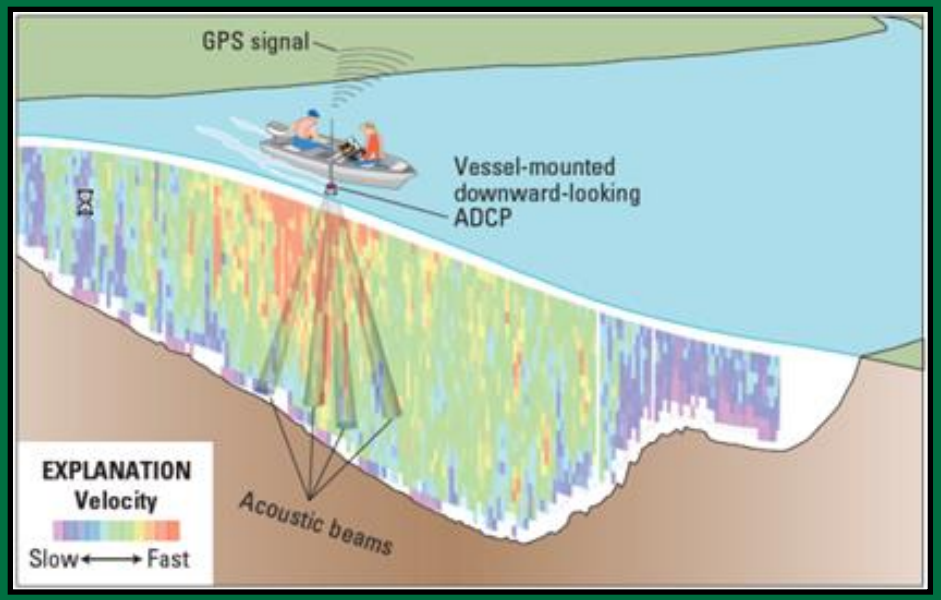
Tasks to be completed

Task 3. Index Velocity Rating Development

- To be developed using ADCP discharge measurements.
- Saltwater barrier has been closed since the installation of the Index-Velocity gage. High flow events need to be sampled to capture variability and properly develop the index velocity rating.



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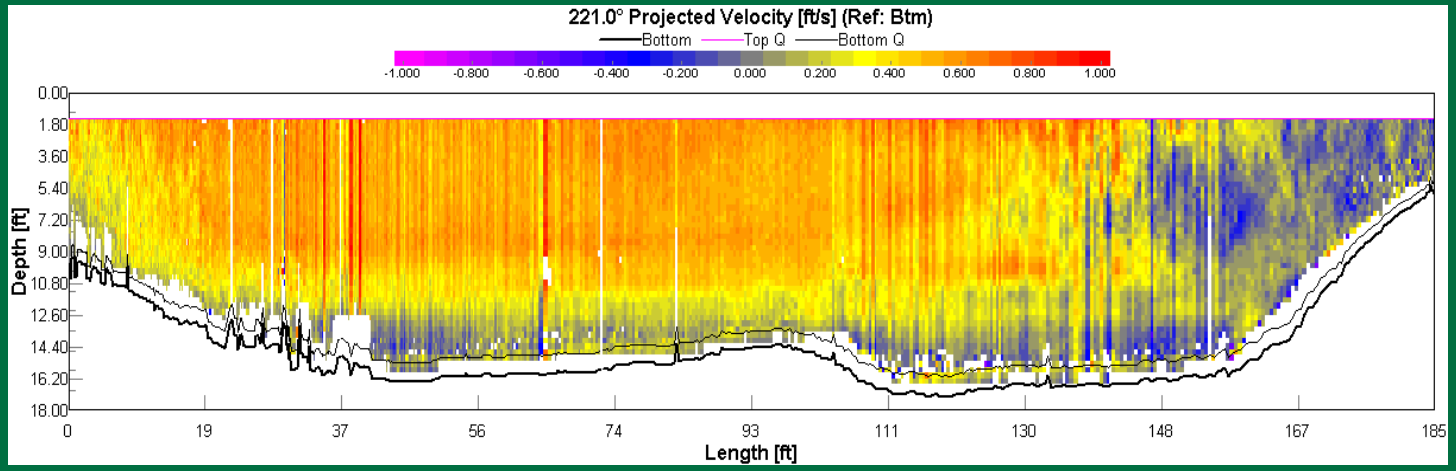
Task 4. Continued Operation of Index Velocity Gage and Hydrologic Monitoring

- Gage will be operated for at least a year after the development of the index velocity rating to evaluate and refine calculations.

- Water quality samples will continue to be collected.



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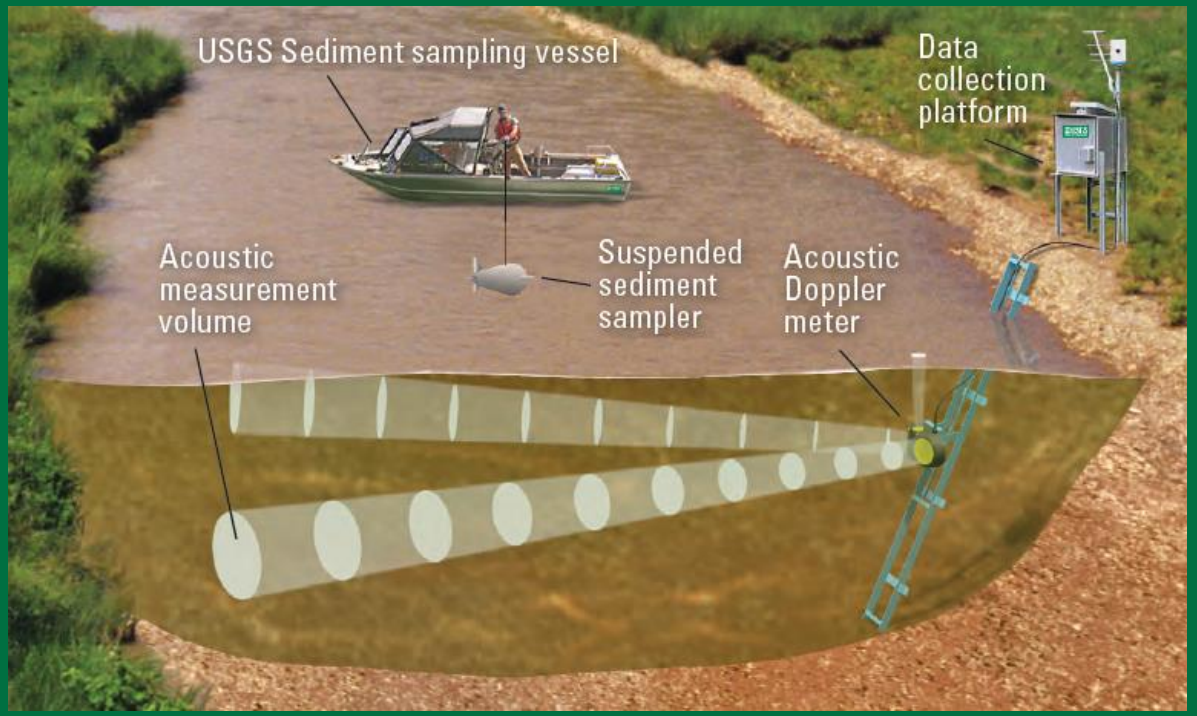
Task 5. Sediment & Nutrient Surrogate Development

- Evaluation of sediment and nutrient data using the backscatter signal of the ADVM to predict real-time estimates of sediment and nutrient concentrations.



USGS

Michael T. Lee
mtlee@usgs.gov

Zulimar Lucena
zlucena@usgs.gov

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